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NOTES ON HEMIBRANCHIATE AND LOPHOBANCHIATE FISHES.

BY HENRY W. FOWLER.

The fishes belonging to the above-named groups contained in the collection of the Academy are listed in this paper. Besides notes on variation, interesting records are given for some species for the first time, and two species are described as new.

GASTEROSTEIDAE.

Spinachia spinachia (Linné)

British Isles and Sweden.

Pungitius pungitius (Linné)

Europe, Sweden, Rostock in Germany, Magdalen Islands, Massachusetts, Salem, Rhode Island, Connecticut, New Jersey. My largest examples show: Head $3\frac{3}{4}$ to 4; depth $5\frac{2}{3}$ to 6; D. ix, often x, rarely xi, 9 or 10; A. i, 9, often 10; length 62 to 70 mm. In the entire series the dorsal shows mostly x, often ix, seldom or rarely viii or xi. In view of the great variation of these spines, even as low as ii have been given by some authors, it is not possible to use them as distinctive characters. The Japanese *Pygosteus steindachneri* Jordan and Snyder and *P. undecimalis* Jordan and Starks are nominal forms supposed to be distinguished chiefly according to their dorsal spines, and may therefore be merged in the synonymy. *Gasterosteus pungitius brachypoda* Bean has been placed as the Greenland representative, on the alleged character of its short ventral spine, which is a little less than half of the head. None of my examples shows the ventral spine more than half of the head, and most of them much less. In the young or small examples, these spines are quite short or small. It is therefore quite likely *Pungitius pungitius* is entirely circumpolar.

Gasterosteus aculeatus Linné.

Prince Edward Island, Magdalen Islands, Halifax, in Nova Scotia, Maine, Long Island, New Jersey, Virginia. Many from the Mediterranean, Lago Nemi and Italy as var. *brachycentrus*. This large series of all ages shows great variation, individual as well as geographical. It is impossible to clearly define the latter. All the

Mediterranean and Italian specimens are naked or partly armed. They show usually 4 plates, less frequently 0 to 5. In young examples from Prince Edward Island the armature is often incomplete, and the long ventral spines slender, frequently extending even $\frac{1}{3}$ beyond the pubic process or even twice length of the dorsal spines. All my Canadian examples have the armature less complete, or less in depth than in New Jersey specimens. This may, however, be due to age, as my largest ones are somewhat less than Long Island and New Jersey material. The Canadian specimens all agree with the Virginian examples, all of which are uniformly small. They have variously long or short spines. All show but a single ventral ray. The characters given by Jordan and Evermann for the nominal American forms¹ are entirely fallacious and my specimens violate all their alleged distinctions.

Gasterosteus aculeatus cataphractus (Pallas)

G. microcephalus Girard, Proc. Acad. Nat. Sci. Phila., 1854, p. 133. Four Creek, San Joaquin Valley, Cal.

Nos. 14,275 to 14,289, A. N. S. P., cotypes of *G. microcephalus* Girard. Others from San Francisco and Oakland, California; Puget Sound; Alaska. The distinctions given by Jordan and Evermann for this nominal form,—its robust form and longer spines, do not hold. A nearly equal variation is found in my Pacific specimens as in the Atlantic, and the present form is only admitted nominally.

Eucalia inconstans (Kirtland)

Gasterosteus micropus Cope, Proc. Acad. Nat. Sci. Phila., 1865, p. 81. Fort Riley, Kansas.

Nos. 14,184 and 14,185, A. N. S. P., cotypes of *G. micropus* Cope. Others from New York, Pennsylvania, Indiana, Iowa and Minnesota. They show D. v, rarely vi, usually 10, often 9, sometimes 8 and rarely 7 or 11; A. i, 9 or 10, rarely 7, 8 or 11; ventral spine $\frac{1}{2}$ to $1 + \frac{1}{3}$; length 24 to 65 mm.

Apeltes quadracus (Mitchill)

Prince Edward Island, Magdalen Islands, Maine, Rhode Island, Long Island, New York, New Jersey, Pennsylvania, Delaware, Maryland. This large series shows a wider range of variation than is usually credited to the dorsal spines. Seven examples have iii, 152 have iv, 283 have v, and 9 have vi. These spines are all very

¹ Bull. U. S. Nat. Mus., no. 47, pt. 1, 1896, p. 746.

variable in length, position and projection. In only one case were 2 closely situated spines found at the soft dorsal origin, the rays of the fin ranging 10 to 12. Only a single oval spine in all the examples, the rays 7 to 10. A young Delaware example shows unusually short or hardly developed innominate bones. The color pattern is also extremely variable, and in no two examples exactly alike.

Four examples Cope reported in 1865², labeled as having been brought from Sukertoppem, Greenland, by Dr. I. I. Hayes, are not *Eucalia inconstans*, with which he sought to identify them. I subsequently wrongly referred four examples, labeled "Godhavn, Disco Island, Davis Straits" from Dr. I. I. Hayes³ to *Gasterosteus aculeatus*, which suggests they may have changed labels.

AULOSTOMIDAE.

Aulostomus maculatus Valenciennes.

Two from Santa Cruz, W. I. Eye $2\frac{1}{5}$ to $2\frac{3}{5}$ in postorbital.

Aulostomus chinensis (Linné)

Honolulu, Hawaiian Islands, Oahu, Pacific Ocean. Eye $2\frac{1}{8}$ to $2\frac{2}{5}$ in postorbital.

FISTULARIIDAE.

Fistularia tabacaria Linné.

Manasquan, Ocean City, Beesley's Point, Angelsea, N. J.; Rio Janeiro, Brazil; Trinidad W. I.; Banda Point, West Africa. This material shows the variations quite extensively. The characters pointed out by Jordan and Starks in their distinctions for *F. petimba* and *F. depressa* are in some instances covered by my material. However the median ridges on the snout above are slightly divergent anteriorly. In all cases the skin is smooth.

Fistularia petimba Lacepede.

Hawaiian and Philippine Islands. I have not found any structural differences for this species, in attempting to distinguish it from the preceding. "Upper lateral edges of snout with few serrations or none" as given by Jordan and Evermann for their *F. tabacaria* in comparison with "upper lateral edges of snout sharply serrated" for *F. petimba*, are surely worthless. The blue spots for

² Proc. Acad. Nat. Sci. Phila., 1865, p. 81.

³ L. c., 1914, p. 365.

F. tabacaria are not found in any of my preserved specimens, either old or recent, apparently soon fading after death. My examples of *F. petimba* are smooth. All show the hind portion of the lateral line armed with firm plates, only less developed in the young, and in small examples some apparently affected by formaline. The same is true of *F. tabacaria*. The examples of *F. petimba* all agree in a slightly less deeply depressed interorbital, with narrower supraorbitals. Even some of the examples of *F. tabacaria* show a similar condition, and this is hardly a likely character for distinction.

MACRORHAMPHOSIDAE.

Macrorhamphosus scolopax (Linné)

Head $1\frac{4}{5}$ to $2\frac{1}{8}$; depth $3\frac{3}{4}$ to $4\frac{1}{2}$; snout $1\frac{3}{4}$ to $3\frac{2}{3}$ in head; eye $2\frac{1}{2}$ to $4\frac{1}{2}$ in snout; D. v or vi—11 or 12; A. 18 or 19. All show great variation in the length of the dorsal spine, as in some it does not depress much beyond the soft dorsal and in others it extends beyond the caudal tips. Its armature also quite variable, though usually distinct. In smaller or young examples obsolete or only few denticles. Young also have shorter snouts, deeper basally. Length 27 to 158 mm. Twenty-six from Italy.

Jordan and Starks state they have compared their *M. sagifue* with two specimens of the present species from the Canaries. They contend *M. sagifue* differs "in being a little more slender and in having a slightly smaller eye and longer snout." All these characters are, however, covered by my material, as the note above will show. Though they fail to note the length of their type it appears to measure according to their figure, about 115 mm. The correct distinctions therefore remain unknown for the nominal *M. sagifue*. None of my specimens appears to represent *M. gracilis* (Lowe) as described by Gunther. It is said to have the body depth $2\frac{3}{5}$ to 3 in space between opercle and caudal base, which is $1\frac{3}{4}$ to $2\frac{1}{2}$ in my specimens. A further distinction is the alleged weak armature of the dorsal spine.

Macrorhamphosus scolopax elevatus (Waite)

Head $2\frac{1}{10}$; depth $4\frac{1}{4}$, or $2\frac{1}{6}$ from gill-opening to caudal base; dorsal spine well armed, not depressible beyond soft dorsal. Victoria.

Centriscoops humerosus (Richardson)

One from Victoria, Australia, 110? mm. (caudal damaged).

CENTRISCIDAE.

Centriscus scutatus Linné.

One without data.

Centriscus strigatus (Günther)

One without data. *Aeoliscus* Jordan and Starks, based on this species, would appear only of sub-generic rank.

PEGASIDAE.

Parapegasus natans (Linné)

Padang, Sumatra.

SYNGNATHIDAE.

Entelurus aequoreus (Linné)

Osphyolax pellucidus Cope, Proc. Acad. Nat. Sci. Phila., 1875, p. 450, Pl. 25, figs. 1-4. Open Atlantic Ocean.

No. 860, A. N. S. P., type of *O. pellucidus* Cope. Duncker has correctly placed this nominal form as a synonym of *Syngnathus aequoreus* Linné⁴ and although the type has been overlooked until now, its identity is unquestioned. It is, however, still in good preservation and shows: Rings 29+62?; D. 37, on 8+3 rings; head $4\frac{3}{4}$ to vent; vent about opposite last third in dorsal base. Length 283 mm. On the basis of the very general type locality this species could hardly be included in the North American ichthyofauna.

Cope gives "thirty-one transverse rows of scuta" though my count shows the above formula. Also he says "dorsal radii sixteen," his figure showing 18, whereas there are actually 37. Also he gives "total length 23 m.," while his specimen is actually 283 mm. long.

Nerophis maculatus Rafinesque.

Rings 21 or 22+50 to 67; D. 21 to 25, on 2 or 3+5 rings. Three from Italy.

Gastrotekeus biaculeatus (Bloch)

Bacon and Philippines.

Doryrhamphinarum lineatum (Valenciennes)

Santo Domingo, W. I. Duncker sets aside *Doryrhamphinarum* Kaup⁵. Kaup included *Syngnathus heterosoma* Bleeker monotypically, and such is here acknowledged as its type. It therefore supersedes *Microphis* as used by Duncker.

⁴ Mitteil. Nat. Mus. Hamburg, 32, 1914 (1915), p. 32.

⁵ Cat. Lophobr. Fish, 185, p. 62.

Doryrhamphinarum brachyurum (Bleeker)

Rings 21 or 22+22 to 25; D. 38 to 43, on 1 or 2+7 or 8 rings. Eleven from Tahiti.

Corythoichthys fasciatus (Gray)

C. elerae Evermann and Seale, Bull. U. S. Bur. Fisher., 26, 1906 (1907), p. 57, fig. 2.

No. 33,252, A. N. S. P., paratype of *C. elerae* Evermann and Seale.

Corythoichthys conspicillatus (Jenyns)

Rings 16+40; D. 31 to 33, on 6 rings. Twelve from Tahiti.

Corythoichthys albirostris Kaup.

Rings 16+32; D. 28, on 4+5 rings. Marco, Lee County, Florida.

Micrognathus jonesi (Günther)

Rings 15 or 16+37 or 38; D. 25, on 1+3 or 4 rings. Three from Anclote Bay and three from Point Pinellos, west coast of Florida, both obtained by Prof. Angelo Heilprin in 1886. This species has not previously been recorded from the coast of the United States. These examples show fewer body rings and more caudal rings than the Porto Rican material reported by Evermann and Marsh.

Compared with *Syngnathus elucens* the present species differs in the median lateral ridge continuous with the lower caudal ridge, and the lower lateral trunk ridges end abruptly close before beginning of the lower lateral caudal ridge.

Syngnathus spicifer Rüppell.

Philippines. Rings 16+40; D. 26, on 7 body rings. This example agrees in most every respect with Rüppell's figure and description. It has upper right body and caudal keels continuous, though a little deflected below the dorsal base. Along this latter area an auxillary short superior parallel keel. As the color has faded the usual dark abdominal cross-bands are not evident.

Syngnathus materni (Fowler)

Corythoichthys materni Fowler, Proc. Acad. Nat. Sci. Phila., 1918, p. 11, fig. 5. Philippines.

Type, No. 47,484, A. N. S. P., of *C. materni* Fowler. In the original account the misleading statement "this species differs from the preceding chiefly in its greatly elongated tail and shorter snout," refers to the specimen of *S. spicifer*, its reference having been deleted from my paper. Abdomen pale brownish, but with indistinct cross-bars.

Syngnathus elucens Poey.

Marquesas and Big Pine Keys, Florida. Rings 16 to 18+28 to 33; D. 28 to 30, in 3 or 4+4 or 5 rings. Length 55 to 117 mm.

Syngnathus schlegelii Kaup.

Yokohama and Otaru, Japan. Rings 19 or 20+40 to 43; D. 34 to 39, on 1+8 to 10 rings. Largest 229 mm.

Syngnathus californiensis Storer.

S. griseolineatus Ayres, Proc. Cal. Acad. Sci., 1854., p. 14. San Francisco Bay.

No. 835, A. N. S. P., type of *S. griseolineatus* Ayres. In very poor condition. Other examples from Monterey and California, and Willamette River, Oregon. Rings 19 to 21+42 to 52; D. 37 to 44, on 1+8 to 10 rings.

Jordan and Evermann say *S. griseolineatus* Ayres differs in a somewhat shorter snout, number of dorsal rays and rings, more keeled snout and dorsal covering 0 or 1+9 rings. My material all appears to be *S. californiensis* and the type of *S. griseolineatus* has at least 18 body rings and not one of the other specimens show less than 19.

Syngnathus pelagicus Linné.

Many examples; 5 labeled "Delaware Bay"; N. Lat. 24° 21' West Long. 34° 32'; N. Lat. 23° 20' West Long. 57° 29'; N. Lat. 23° 59' W. Long. 37° 59'; Lake George, Florida. Rings 16 or 17+29 to 32; D. 28 to 33, on 2 to 4+4 to 7 rings. All this material is characterized by the vertical white lines on the trunk, one on each ring inferiorly.

Jordan and Evermann place this species in their key under the group with "dorsal covering 4 or 5 body rings" and immediately below as "on 1+9 rings." In only one example (Lake George) have I found the dorsal on 4+4 rings. I cannot find *Siphostoma scovelli* Evermann and Kendall is distinct, and in fact its alleged distinctions are covered by the variations in my material.

Syngnathus fuscus (Storer)

Massachusetts, New Jersey, Delaware, Maryland and Virginia. Also one labeled "Neuse River, North Carolina." Rings 17 to 20+36 to 40; D. 32 to 40, on 4 to 6+4 to 6 rings. Largest 240 mm.

Syngnathus mackayi Swain and Meek.

Marquesas and Big Pine Keys, Florida. Rings 17 or 18+31 to 35; D. 29 to 31 on 1 to 3+5 to 7 rings. Largest 160 mm.

Syngnathus louisianae (Günther)

Marquesas and Big Pine Keys, Hailer's Rock, West Palm Beach and Pensacola, Florida. Rings 20 to 23+35 or 36; D. 33 or 34, on 3 or 4+4 to 6 rings. Largest 283? mm.

Syngnathus acus Linné.

Italy and Sweden. Rings 15 to 20+33 to 43; D. 33 to 39, on 1 to 3+6 to 9 rings. Largest 333 mm. In most upper lateral caudal keel continuous with median lateral keel of trunk.

Syngnathus pellegrini Fowler.

Proc. U. S. Nat. Mus., 56, 1919, p. 265, fig. 11. Gabun, West Africa.

Nos. 975 to 978, A. N. S. P., type and paratypes.

Typhlinus typhle (Linné)

Italy and Gulf of Spisia.

Stigmatophora argus (Richardson)

One from "Fiji" wrongly identified by me as *S. nigra* Kaup. Rings 19+48?; D. 42, on 8+6 rings. Likely this specimen is actually from Australia.

Leptonotus tristriatus n. sp. Fig. 1.

Head $2\frac{4}{5}$ to vent; depth 11; D. 42, on 3+8 rings, P. 12; rings 21+40? (tail damaged); snout about $1\frac{1}{2}$ in head; eye $2\frac{3}{4}$ in post-orbital region.

Body elongated, slender, well compressed, and apparently deepest midway in trunk, and combined head and trunk at least less than tail. Upper keels on each side of back extend back to seventh caudal ring. This replaced by similar parallel keel, beginning on last trunk ring and entirely continuous posteriorly. Median lateral keel from pectoral axis, and ends on last keel of trunk. Median belly keel complete from breast to vent. Lower keel along each side of body complete.

Head slender, attenuate, compressed, upper profile nearly straight. Snout greatly longer than rest of head. Eye rounded, small, though now little left but orbital rim, which at least $\frac{3}{5}$ of head depth at that point. Mouth small, terminal. Interorbital flat. Opercle without horizontal keel and fine striae radiating above and below.

Gill-opening?

Rings firm, and keels without spines. Each ring with numerous fine striae, vertical on plates.

Dorsal origin well before vent, fin small and rays rather short. Anal very small. Pectoral half length of postocular region.

Color in alcohol largely faded dull brownish. Back dull brown, with obscure paler dots or minute rounded spots. Dorsal pale brown. Brown band along side of snout to eye, and continued back over opercle and upper side of back, gradually merging in color of latter before dorsal. Median narrow streak of same color on upper surface of snout, continued over upper surface of head to predorsal, and much narrower than lateral head bands, or across interorbital about one-third its width. All these bands on head with margins darker or as if bordered with dusky-brown lines.

Length about 136 mm., measured to end of broken tail.

Type, No. 33,136, A. N. S. P. Fiji. Mrs. Agnes F. Kenyon.

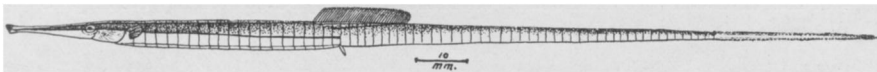


Fig. 1.—*Leptonotus tristriatus* n. sp.

This species is related to *Leptonotus norae* Waite⁶ in the number of its rings and length of its snout. It differs, however, markedly in color-pattern. Originally I wrongly recorded this species as *Syngnathus semistriatus* (Kaup), a species which it appeared to resemble in structure, though it also differs strikingly in color-pattern.

(*Tri*, three; *stria*, stripe; for the color-pattern chiefly on the head.)

Solenognathus guntheri Duncker.

Rings 25 or 26+56 or 57; D. 40? to 43? Two adults from Victoria, Australia, and two without data. They all agree with *S. hardwickii* Waite⁷, which has been named *S. guntheri* by Duncker.

Phyllopteryx foliatus (Shaw)

Two males and 4 females from Portland, Victoria. *Syngnathus taeniloatus* Lacépède⁸ is synchronous with Shaw.

Hippocampus hippocampus (Linné)

Italy and Port Mahon, Minorca. D. 16 to 19, on 3+1 rings; rings 12+35 or 36. Also a number of dried examples without data.

Hippocampus hudsonius De Kay.

Rhode Island, New Jersey, Delaware. D. 17 to 20, on 3 or 4+1

⁶ Records Canterbury Mus., I, No. 3, 1911, p. 173, Pl. 27, fig. 1.

⁷ Proc. Linn. Soc. N. S. Wales, (2) 9, 1894, p. 221, Pl. 17, figs. 2-4, 7.

⁸ Ann. Mus. Hist. Nat. Paris, 4, 1804, p. 211, Pl. 58, fig. 3.

rings; rings 11 to 13 + 34 to 38. This species is very close to the preceding, and may not eventually prove to be distinct. The specimens fail to show any tangible structural characters and the variations are in most every way conformable. Both have a similar general style of coloration, even to the dark median ventral keel and submarginal dark band on the dorsal. The female likewise shows the vent in a dark area.

Hippocampus punctulatus Guichenot.

Bermuda; Vera Cruz, Mexico; Port of Silam, Yucatan; Bahamas; Santa Cruz, W. I.; Key West, Marquesas Keys and Useppa Island, Florida; Maldonado Bay, Uruguay; São Thome, Portuguese Guinea. The Useppa Island example agrees in most every respect with the nominal color variety *H. brunneus* Bean⁹. Possibly *H. styliifer* Jordan and Gilbert is another variation, though none of my examples shows so few as 16 D. rays.

Hippocampus sindonis Jordan and Snyder.

A dried example labeled "coast of Japan," from Dr. W. N. Whitney, conspicuous for its extremely high bony occipital crest.

Hippocampus ingens Girard.

Two in bad preservation, from Panama.

Hippocampus zosterae Jordan and Gilbert.

Marquesas Keys, Florida.

Hippocampus kuda Bleeker.

H. taeniops Fowler, Journ. Acad. Nat. Sci. Phila., (2) 12, 1904, p. 501, Pl. 7 (upper left fig.). Padang, Sumatra.

No. 27,469, A. N. S. P., type of *H. taeniops* Fowler.

Hippocampus abdominalis Lesson.

H. bleekeri Fowler, Proc. Acad. Nat. Sci. Phila., 1907, p. 426, fig. 4. Victoria, Australia.

H. agnesae Fowler, l. c., 429, fig. 5. Victoria.

No. 33,122, A. N. S. P., type of *H. bleekeri* Fowler.

No. 33,123, A. N. S. P., type of *H. agnesae* Fowler.

Hippocampus ecuadorensis n. sp. Fig. 2.

Head, measured to gill opening, $1\frac{1}{4}$ in trunk; depth of trunk 2 in its length; width of trunk about 4; trunk $2\frac{1}{4}$ in tail; D. 22; A. 5; P. 16; rings 11 + 36; depth of head at coronet $1\frac{3}{4}$ in its length; width of head $3\frac{1}{2}$; snout $2\frac{1}{5}$; eye $6\frac{1}{3}$; dorsal base $2\frac{8}{8}$; interorbital space $1\frac{1}{2}$ in eye.

⁹ Field Mus. Pub. Zool., 7, July 1906, p. 39, fig. 1. Bermuda.

Body long, moderately deep, trunk short and well compressed. Trunk long, slender, slightly compressed.

Head moderately large, compressed. Snout slightly attenuated, wide as deep basally. Eye moderate, midway in head length. Mouth terminal, broad, superior, and closed lower jaw slightly in-

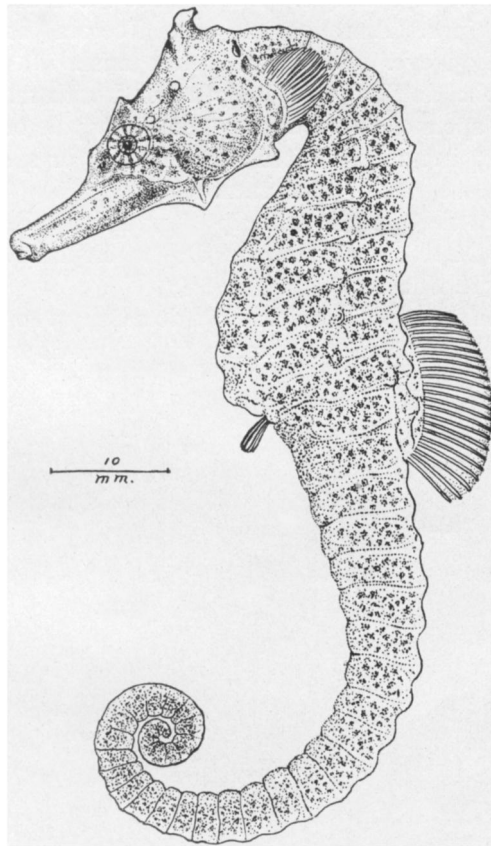


FIG. 2.—*Hippocampus ecuadorensis* n. sp.

cluded. Nostrils small, close together and close before front rim of orbit. Interorbital narrow, triangular, concave.

Gill-opening about half of eye, inclined in vertical, laterally superior on nape.

Coronet moderately elevated, with two lateral ridges and median

posterior ridge. Below and slightly in advance, a strong spine directed laterally. Slight median ridge above nostrils. Supraocular spine broad and directed laterally. Very small postorbital tubercle, close behind eye. Shoulder-girdle with three moderately large tubercles. Opercle with rather obsolete radiating striae. Body-rings with edges as ridges, without spines, though at some junctures slight tubercles. Ridges on tail-rings more or less obsolete.

Fins moderate, rays simple. Dorsal base moderate, on 2 body and 2 caudal rings. Anal long as eye. Pectoral base broad, fin little longer than eye. Vent close before anal.

Color in alcohol dull brown. Body marked with numerous small round obscure spots of dull brown. Also many pale or whitish dots sprinkled about irregularly, often as short lines or specks. Dorsal and pectoral, pale, uniform or unmarked.

Length, from tip of coronet to tip of extended tail, 145 mm.

Type, No. 24,198, A. N. S. P. Bahia, Ecuador. September, 1884. Dr. W. H. Jones.

Differs from *H. ingens* Girard in more dorsal rays, larger eye, blunt body and tail rings, and the absence of dermal flaps.

(Named for Ecuador.)